California Regional Water Quality Control Board

Central Valley Region

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SUBJECT: **Review, 25 April 2006 Report of Findings, Former Orchard Carriers, Inc., Corning, Tehama County**

Introduction

Several identified domestic wells south of Corning have chlorinated ethenes. Central Valley Regional Water Quality Control Board (Central Valley Water Board) Redding office staff and environmental consultants have found Trichloroethene (TCE) and cis-1,2-Dichloroethene (c-1,2-DCE) in six private wells on Toomes and Houghton Avenues. Perchoroethene (PCE) is in a private well on Highway 99 West and in a municipal well near Houghton and Grant Avenues (Haling and Associates, 2001, 2003). Potential sources are under investigation.

Solvents in three impacted Toomes Avenue private wells may correlate to a hot spot near a property boundary common to a truck stop and a light industrial property. The former owner-operator of the truck stop, 2120 South Avenue, was the now bankrupt Dudley and Petty, Inc., Discharger, Cleanup and Abatement Order No.96-701, rescinded. Data there indicate a chlorinated ethene hot spot near an aboveground tank farm site. The former owner-operator of the light industrial property east of the truck stop was Orchard Carriers, Inc. (OCI), orchard equipment manufacturer, 2060 South and 1745 Toomes Avenues. A private party alleges OCI disposed of waste solvent on-site; preliminary data confirmed near-grade solvents.

North East L.L.C. now owns former Dudley and Petty property, a brown-field investment redeveloped as a Flying J truck stop, and is responsible for pollution, Cleanup and Abatement Order No. R5-2004-0709. The Neoma Mae Duncan Trust (Duncan Trust) is the entity associated with former OCI. Due to preliminary data, on 25 February 2004 Central Valley Water Board staff requested the Duncan Trust further investigate.

Report Review

The Duncan Trust collected soil and groundwater data from six, continuously cored direct push borings (West 2006). Of these, four borings were in an east-west traverse, from a passive soil gas chlorinated ethene detection near the current K.M. Dagorret lease building, 2060 South Avenue (West 2003), toward the former aboveground tanks on North East L.L.C. property. Two others were near detections by the current Omega Waste Management lease building, 1745 Toomes Avenue. The four borings in the traverse indicated impacts to groundwater. Preliminary groundwater samples from all four had sheens of light non-aqueous phase liquid (LNAPL). Laboratory results of associated groundwater indicate diesel fuel. LNAPL may correlate to a large fuel spill during the 1970s at the aboveground tank farm site (Central Valley Regional Water Board 2000).

Results from the boring farthest west in the traverse also indicate a bio-chemically weathered chlorinated ethene hot spot. A soil sample from boring S-1, 10 feet below grade surface (bgs), showed c-1,2-DCE at 2,210 micrograms/Kilogram (µg/Kg) and petroleum hydrocarbons, mainly diesel constituents, that sum to 59,510 µg/Kg. The sample is from an aquitard unit that underlies the shallowest perched aquifer. Assuming fraction of organic carbon (f_{oc}) of 0.003 (West 2006, see boring S-4, 5 feet bgs_1), and soil-organic carbon coefficient (K_{oc}) of 35.5 Liters/Kilogram (L/Kg, Weiner 2000), the c-1,2-DCE distribution coefficient, $K_d = K_{oc} * f_{oc} = 0.107$ L/Kg. Because K_d is the ratio $C_s/C_{w,}$, concentration in soil/concentration in water, estimated aquitard pore water concentration is therefore 20,654 micrograms/Liter (µg/L). Pure phase c-1,2-DCE solubility is $3.5*10^6$ µg/L. The estimated pore water concentration, 0.6 % of pure phase solubility, suggests dense non-aqueous phase liquid (DNAPL) has diffused nearby into the aquitard. Modal c-1,2-DCE, a product of reductive de-chlorination, associated with concentrated petroleum hydrocarbons suggests bacteria, using petroleum, reductively made c-1,2-DCE from precursors, TCE or PCE.

Other data indicate relatively lower chlorinated solvent concentrations. For example, nearby monitoring well AGT-MW-9 shows c-1,2-DCE from 21 to 330 µg/L, consistent with shallow soil gas concentration from its pilot boring, SB-22, 6,750 parts per billion by volume, 27.3 µg/L-gas, from 4 feet below grade. At a typical groundwater concentration, 250 µg/L, the Henry's Law coefficient (K_H), gas concentration/groundwater concentration, is 0.109 (dimensionless); assuming temperature of 17 degrees $Centrigrade_2$, this agrees with experimental c-1,2-DCE K_H values; see http://www.epa.gov/athens/learn2model/part-two/onsite/esthenry.htm. Observed groundwater ethene concentrations, reasonable based on active soil gas, are far less than pure phase solubilities. While this may be in part due to dilution effects of relatively long slotted casing intervals, it appears existing shallow monitoring well locations may not adequately characterize the perched aquifer.

Passive soil gas data indicate a hot spot west of the subject boundary. Consultants for North East L.L.C. (Nichols 2004) and the Duncan Trust both sampled shallow soil gas with Emflux® passive soil gas samplers. Qualitative data from the North East L.L.C. survey were from the winter-wet season, those from the Duncan Trust, from the summer-dry season. Therefore, North East L.L.C.'s data may be biased low relative to Duncan Trust's. North East L.L.C. points #59 and #62, along the fence-line, show PCE, TCE, and c-1,2-DCE, 512, 246, and 237, and 63, 625, and 111 nanograms (ng), respectively . These two points offset Duncan Trust

point P-2, which had only PCE, at 835 ng. Sums of detected chlorinated ethenes for #59, #62, and P-2 are, respectively, $7.40*10^{-9}$, $6.28*10^{-9}$, and $5.04*10^{-9}$ moles. Therefore, the original center of mass was likely relatively nearest point #59, on North East L.L.C. property, about 20 feet south-southeast of AGT-MW-9.

Interpretation

Based on current data, it appears that an unknown person spilled DNAPL on the ground at the former Dudley and Petty property, between the former aboveground tank farm and the fence. The DNAPL likely penetrated downward through the shallowest perched aquifer, highly permeable sand and gravel, and diffused into the underlying aquitard. Because spillage was into soil with high petroleum pollutant concentrations, anaerobic bacteria, feeding on petroleum, partially de-chlorinated the spill. Original maximum dissolved chlorinated ethene concentrations were likely high enough to account for impacts to the identified Toomes Avenue domestic wells.

Recommendations

Due to insufficient probable cause, request no further action on SLIC Case#SLT5R976, former OCI. Assume North East L.L.C. is solely responsible for the release near the former aboveground tank farm, therefore, the identified pollution in the subject Toomes Avenue private domestic wells.

Footnotes

1. Also, soil boring SB-22 (Haling and Associates 2001) showed c-1,2-DCE at 13 µg/Kg in aquitard soil at 15 feet bgs. The above estimated K_d results in a pore water concentration of 121 µg/L, similar to observed groundwater concentrations in wells AGT-MW-7 and AGT-MW-9. Therefore, the assumed f_{oc} appears reasonable.

2. For the temperature, 17 Degrees Centigrade, 63 degrees Fahrenheit, see the map of mean annual groundwater temperatures for the Central Valley on the above website.

References

Central Valley Regional Water Quality Control Board 2000. *Interview with Mr. Thomas Russ et al., regarding the former Dudley and Petty Truck Stop Site, Corning, Tehama County*, technical memorandum from Eric Rapport to Phil Woodward, 22 December.

Haling and Associates 2001. *Focused Environmental Site Investigation and Quarterly Monitoring Report, Former Dudley*[sic] *Truckstop, Corning, California*. October.

Haling and Associates 2003. *Final Report, Investigation of VOC Contamination, Private Domestic and Irrigation Well Sampling, Former Dudley* [sic] *Truckstop, Corning, California*. July.

Nichols Consulting Engineers, Chtd. 2004. *Soil Gas Data and Vapor Intrusion Preliminary Design, Former Dudley and Petty Truck Stop, Corning, California*. December.

Weiner, Eugene, R. 2000. *Applications of Environmental Chemistry, A Practical Guide for Environmental Professionals*. ISBN 1-56670-354-9, Lewis Publishers, 276 pages.

West Environmental Science and Technology 2003. *Passive Soil Gas Report, 2060 South Avenue and 1745 Toomes Avenue, Corning, California*. December.

West Environmental Science and Technology 2006. *Report of Findings, 2060 South Avenue and 1745 Toomes Avenue, Corning, California*. April.

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